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Greene et al.

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(54) **SYSTEM AND METHOD FOR DISTRIBUTING EMERGENCY DATA MESSAGES TO PUBLIC SAFETY ANSWERING POINTS IN A BALANCED MANNER**

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Related U.S. Application Data

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H04M 11/04 (2006.01)

(52) **U.S. Cl.**
USPC **455/404.1**; 455/404.2; 455/466

(58) **Field of Classification Search**
USPC 455/404.1, 404.2, 456.1–457, 466
See application file for complete search history.

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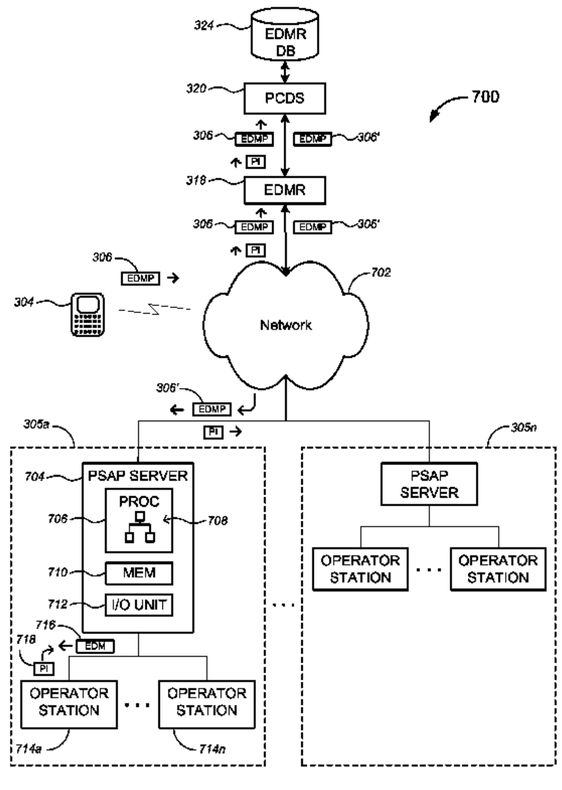
(74) *Attorney, Agent, or Firm* — Swanson & Bratschun, L.L.C.

(57) **ABSTRACT**

A system and method for routing emergency data messages to public safety answering points may include identifying PSAPs local to the user and configured to receive emergency data messages. A determination of distribution of previous emergency data messages to the identified PSAPs may be performed. Based on the distribution of previous emergency data messages to the identified PSAPs, one of the identified PSAPs may be selected and the emergency data message may be routed thereto.

12 Claims, 6 Drawing Sheets



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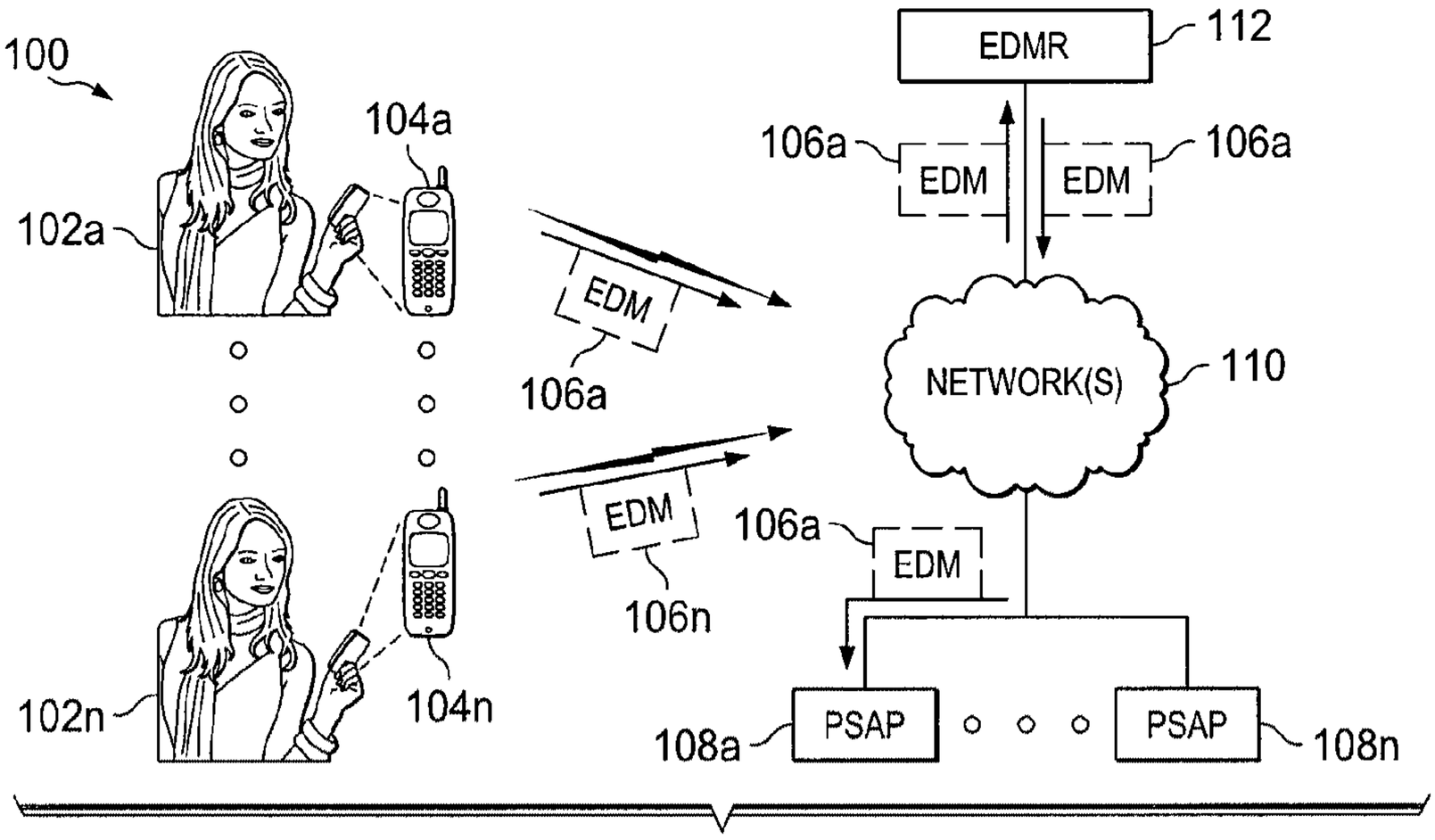
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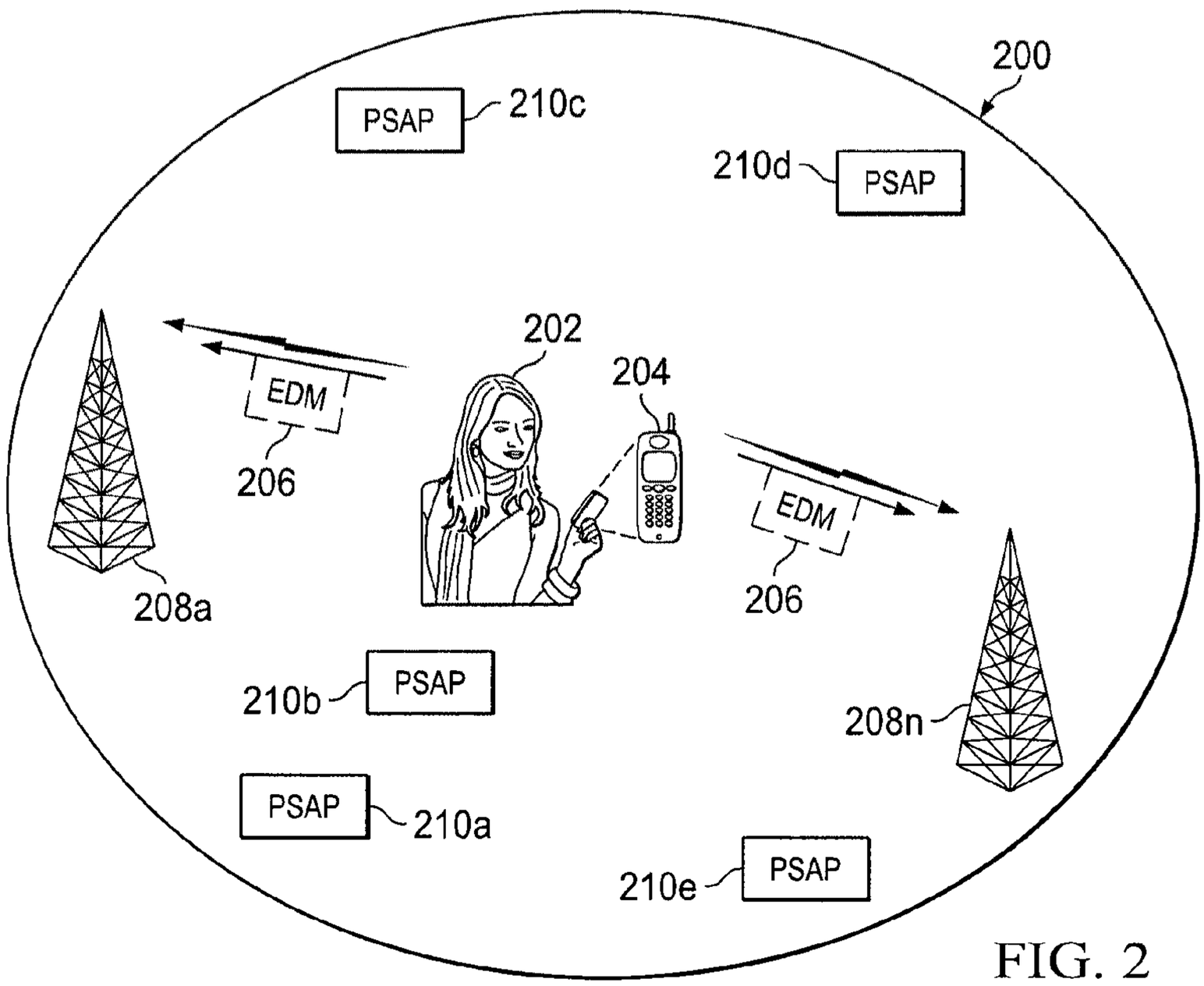
NETWORK(S)
110
106a
EDM
PSAP
108a
PSAP
108n

FIG. 1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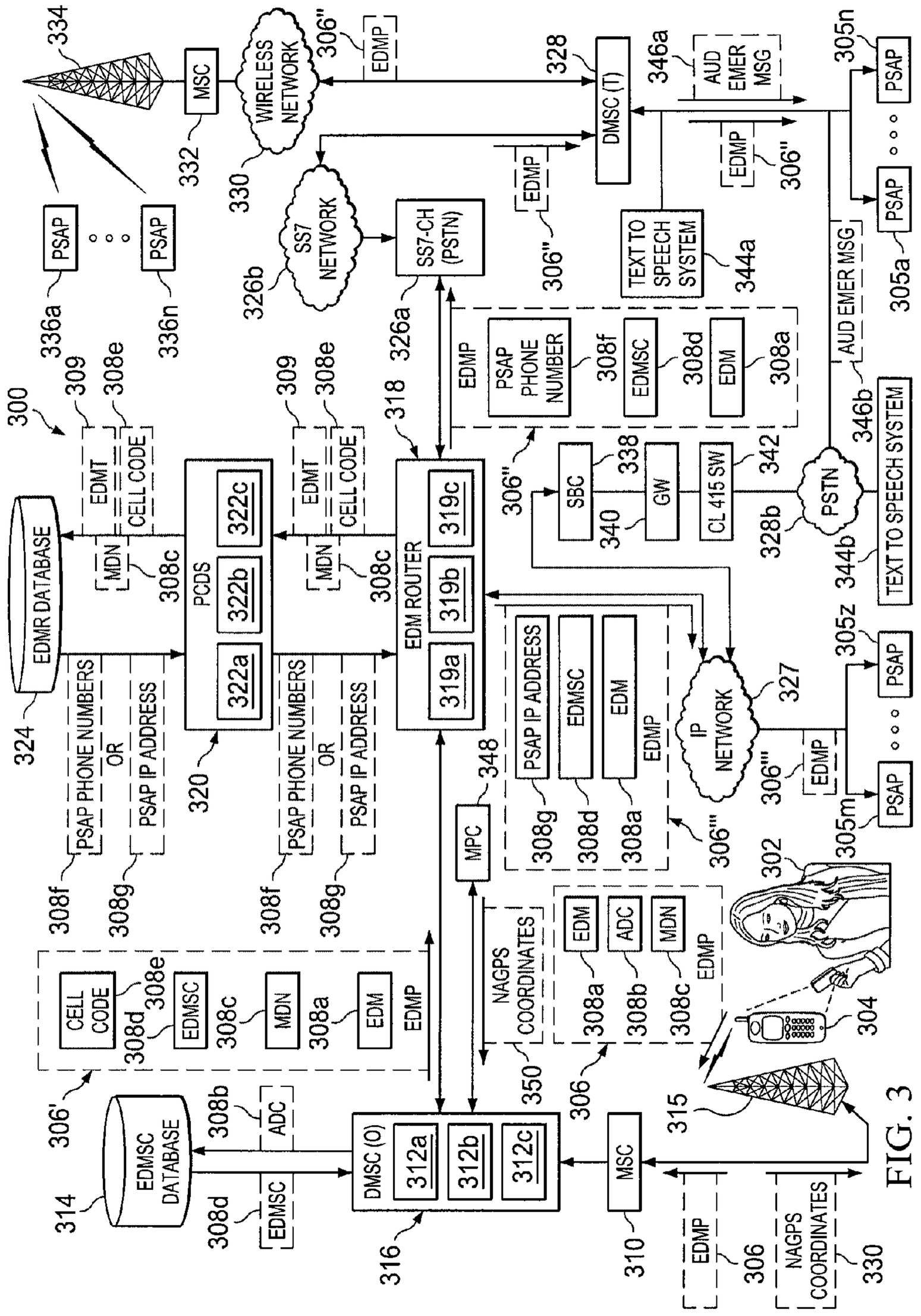
210e
PSAP

FIG. 2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MSC
332
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EDMP
328
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346a
AUD EMER MSG
305n
PSAP
330
326b
SS7 NETWORK
SS7-CH (PSTN)
EDMP
306"
TEXT TO SPEECH SYSTEM
344a
EDMP
306"
PSAP
305a
336a
336n
300
309
308e
EDMT
CELL CODE
EDMR DATABASE
MDN
308c
PCDS
322a
322b
322c
318
326a
EDM ROUTER
319a
319b
319c
EDMP
PSAP PHONE NUMBER
308f
EDMSC
308d
EDM
308a
306"
SBC
340
338
GW
CL 415 SW
342
328b
PSTN
346b
AUD EMER MSG
344b
TEXT TO SPEECH SYSTEM
324
PSAP PHONE NUMBERS
OR
PSAP IP ADDRESS
320
MPC
348
PSAP IP ADDRESS
308g
EDMSC
308d
EDM
308a
EDMP
306"'
IP NETWORK
327
305z
PSAP
306"'
EDMP
305m
PSAP
302
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308e
EDMSC
308c
MDN
308a
EDM
EDMP
306'
NAGPS COORDINATES
350
EDM
308a
ADC
308b
MDN
308c
EDMP
306
304
315
EDMSC DATABASE
314
308b
ADC
308d
EDMSC
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312a
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310
EDMP
306
NAGPS COORDINATES
330

FIG. 3

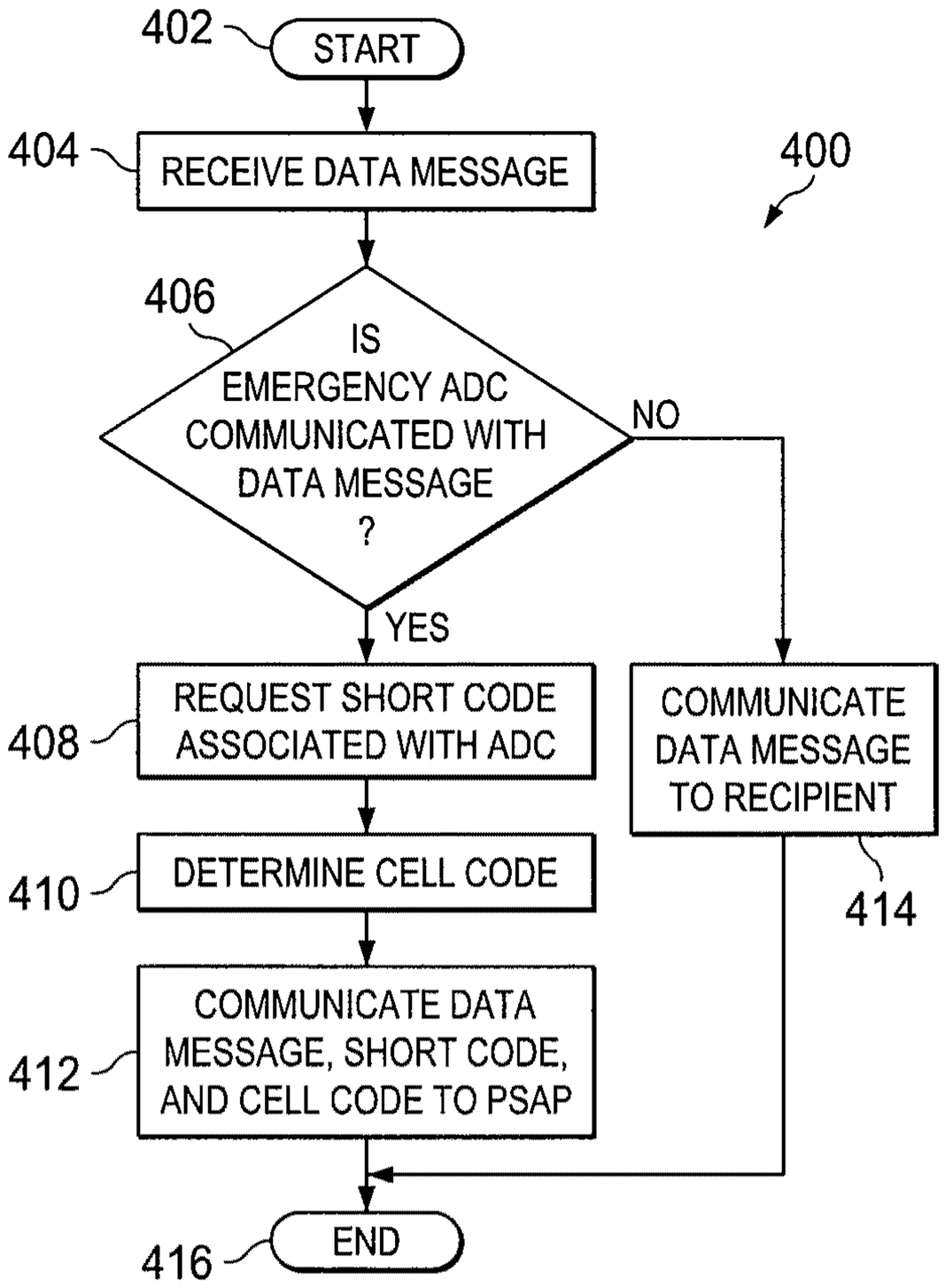

402
START
404
RECEIVE DATA MESSAGE
400
406
IS EMERGENCY ADC COMMUNICATED WITH DATA MESSAGE ?
NO
YES
408
REQUEST SHORT CODE ASSOCIATED WITH ADC
410
DETERMINE CELL CODE
412
COMMUNICATE DATA MESSAGE, SHORT CODE, AND CELL CODE TO PSAP
COMMUNICATE DATA MESSAGE TO RECIPIENT
414
416
END

FIG. 4

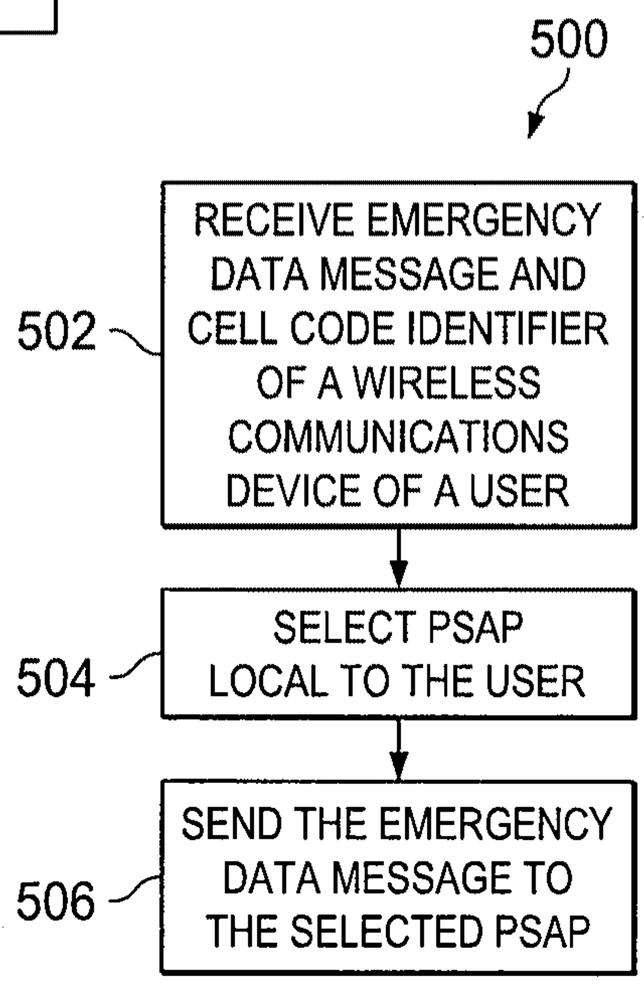

500
502
RECEIVE EMERGENCY DATA MESSAGE AND CELL CODE IDENTIFIER OF A WIRELESS COMMUNICATIONS DEVICE OF A USER
504
SELECT PSAP LOCAL TO THE USER
506
SEND THE EMERGENCY DATA MESSAGE TO THE SELECTED PSAP

FIG. 5

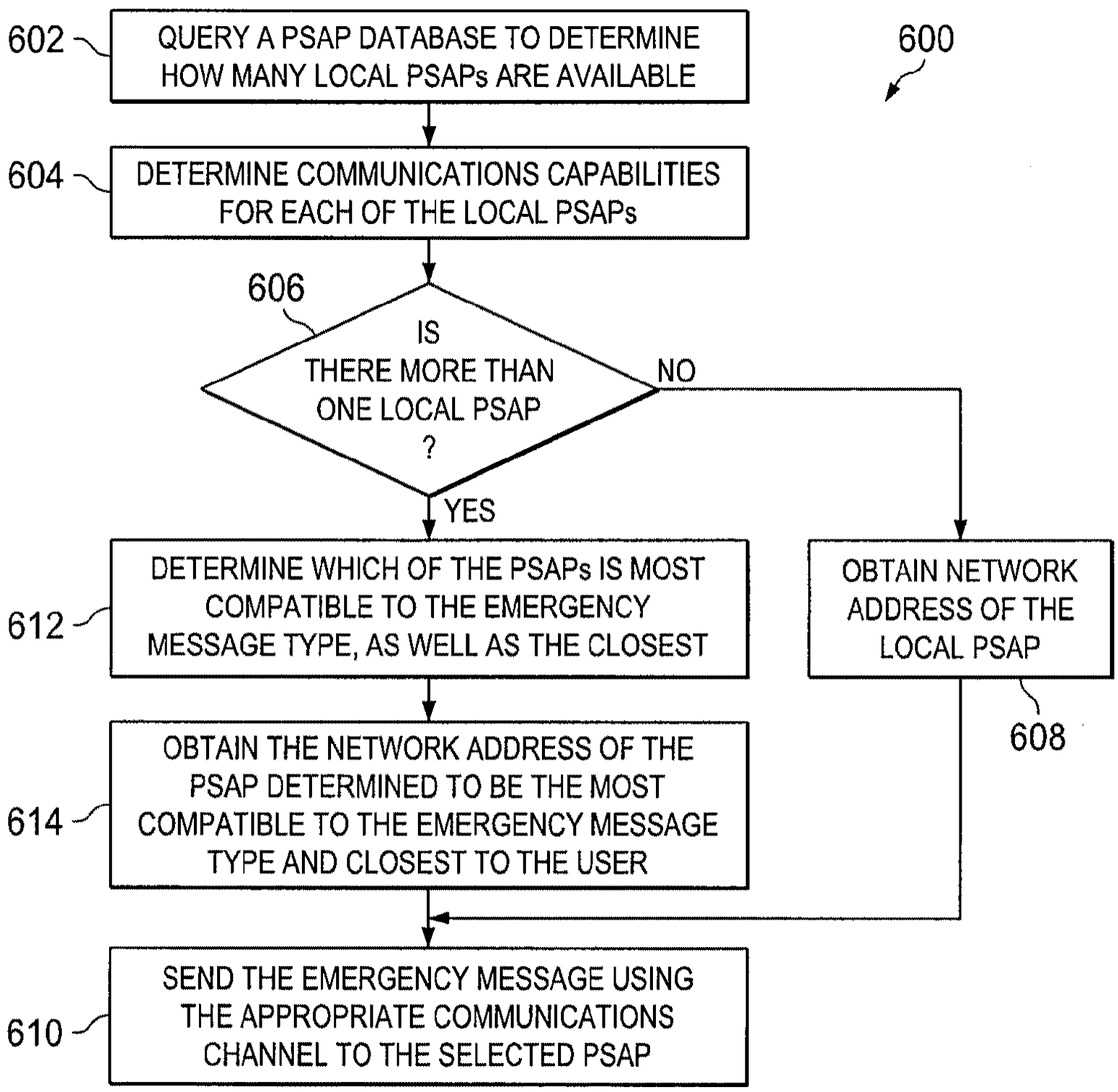
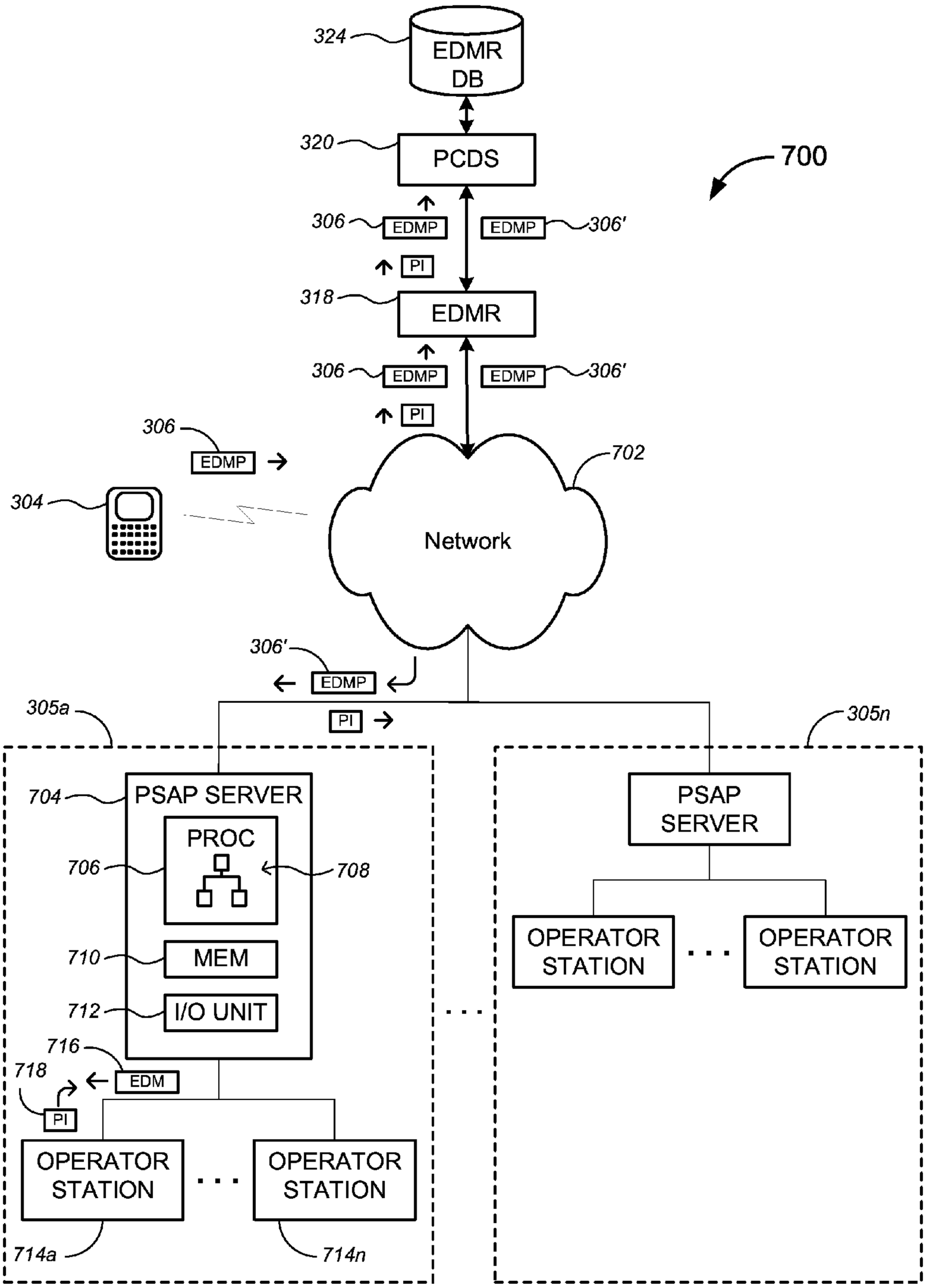

600
602
QUERY A PSAP DATABASE TO DETERMINE HOW MANY LOCAL PSAPs ARE AVAILABLE
604
DETERMINE COMMUNICATIONS CAPABILITIES FOR EACH OF THE LOCAL PSAPs
606
IS THERE MORE THAN ONE LOCAL PSAP ?
NO
YES
612
DETERMINE WHICH OF THE PSAPs IS MOST COMPATIBLE TO THE EMERGENCY MESSAGE TYPE, AS WELL AS THE CLOSEST
614
OBTAIN THE NETWORK ADDRESS OF THE PSAP DETERMINED TO BE THE MOST COMPATIBLE TO THE EMERGENCY MESSAGE TYPE AND CLOSEST TO THE USER
OBTAIN NETWORK ADDRESS OF THE LOCAL PSAP
608
610
SEND THE EMERGENCY MESSAGE USING THE APPROPRIATE COMMUNICATIONS CHANNEL TO THE SELECTED PSAP

FIG. 6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EDMR DB
320
PCDS
700
306
EDMP
EDMP
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PI
318
EDMR
306
EDMP
EDMP
306'
PI
306
EDMP
304
702
Network
306'
EDMP
305a
PI
305n
704
PSAP SERVER
PROC
706
708
710
MEM
712
I/O UNIT
716
EDM
718
PI
OPERATOR STATION
OPERATOR STATION
714a
714n
PSAP SERVER
OPERATOR STATION
OPERATOR STATION

Fig. 7

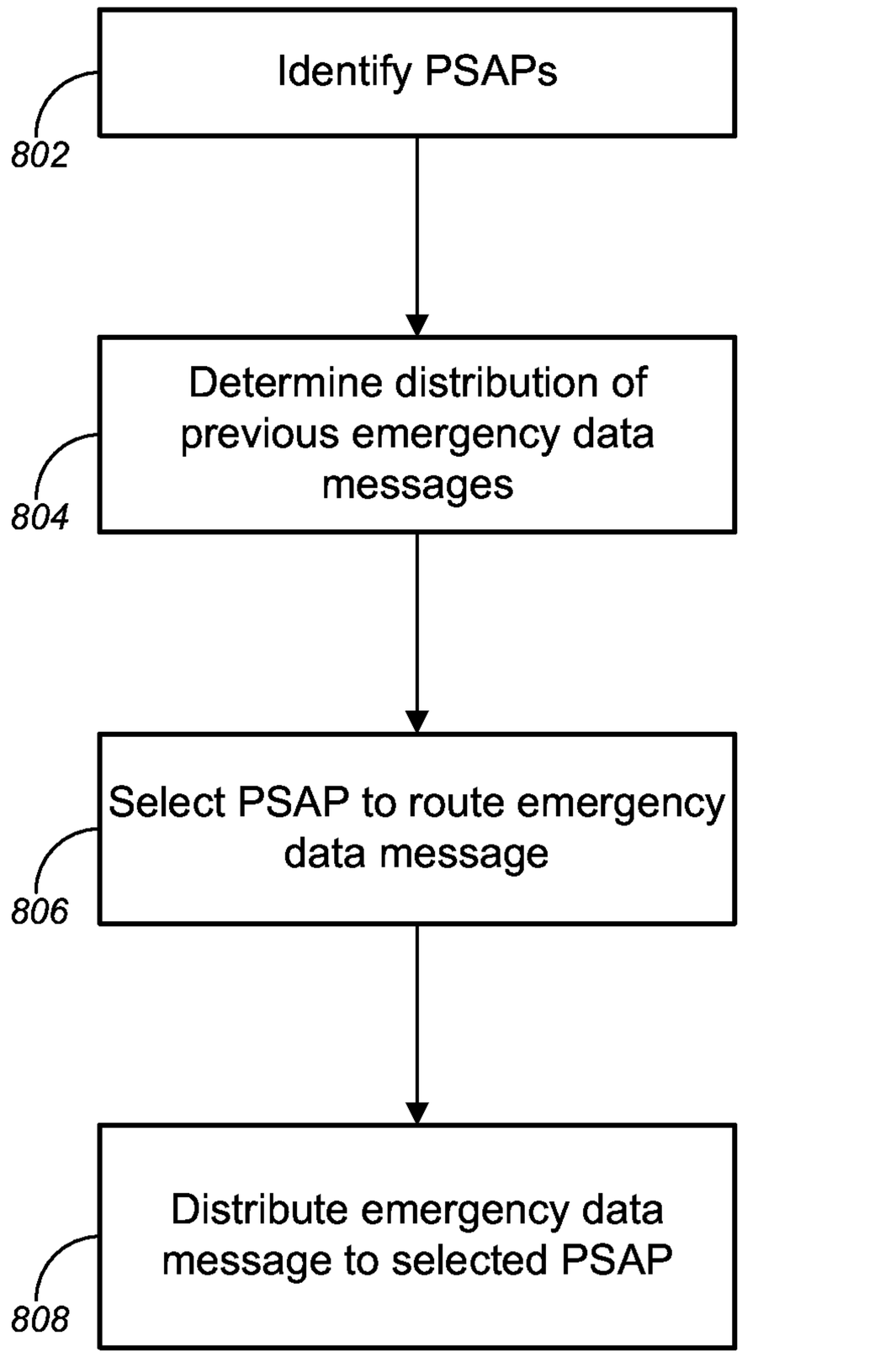
Identify PSAPs
802
Determine distribution of previous emergency data messages
804
Select PSAP to route emergency data message
806
Distribute emergency data message to selected PSAP
808
800

FIG. 8

SYSTEM AND METHOD FOR DISTRIBUTING EMERGENCY DATA MESSAGES TO PUBLIC SAFETY ANSWERING POINTS IN A BALANCED MANNER

CROSS REFERENCE TO RELATED APPLICATIONS

This Application claims priority to co-pending Provisional Patent Application Ser. No. 61/078,123 filed on Jul. 3, 2008; the entire teachings of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

Emergency 911 services have traditionally been performed by a user placing a telephone call to "911." Prior to mobile communications developing, users would dial "911" on landlines, and the public switched telephone network (PSTN) would route the call to a public safety answering point (PSAP) local to a street address of the landline telephone used to place the call.

With mobile and wireless telephones, the address of a user in an emergency call is unknown. To determine the address or location of the caller, various techniques for determining geographic positioning of the caller are performed, including using global positioning system (GPS) equipment and network assisted positioning by using triangulation, as performed by a communications network. The communications network identifies the emergency "911" call and, based on the location of the caller, routes the call to a local PSAP with respect to the location of the caller. Depending on the technology used by the PSAP, geographic coordinates may be sent to the PSAP. If the PSAP is configured with enhanced "911" or E-911 Phase II, then a local automatic location identification (ALI) database may be used to convert the geographic coordinates to address-based coordinates.

As mobile telecommunications have advanced, different forms of data messaging communications have been developed, including text messaging, instant messaging, photo messaging, and video messaging. To accommodate these new forms of communications, a few PSAPs have advertised specific telephone numbers that users can send a text message, for example, to notify emergency services of an emergency. The problem is that unless a user has saved the emergency telephone number in his or her mobile device, the user is unlikely to remember the telephone number or not have time to enter the telephone number during an emergency situation. Furthermore, if the user has traveled any sufficient distance from a PSAP that has a specific telephone for sending text messages, then the PSAP is no longer local to the user. PSAPs, especially those in metropolitan areas, can be overloaded with emergency calls, which causes people with emergencies to have to wait to speak with an operator.

SUMMARY

To overcome the problem of users not being able to send emergency data messages, such as text messages, to a common, easy to remember address that will be routed to a PSAP local to a user and to reduce waiting time for responses to users, the principles of the present invention provide for a system configured to determine a PSAP local to the user and route an emergency data message to the PSAP. The system may further be configured to manage distribution of emergency data messages to PSAPs so as to balance the number of emergency data messages sent to the PSAPs. The balancing may be based on volume and/or capacity of the PSAPs.

One embodiment of a system for routing emergency data messages to public safety answering points may include a memory, input/output (I/O) unit, and processing unit in communication with the memory and I/O unit. The processing unit may be configured to receive an emergency data message and cell code identifier indicative of a location of a wireless communications device of a user, identify PSAPs local to the user and configured to receive emergency data messages, and determine distribution of previous emergency data messages to the identified PSAPs. The processing unit may further be configured to select one of the identified PSAPs to route the emergency data message based on the distribution of previous emergency data messages to the identified PSAPs, and route the emergency data message to the selected PSAP.

One embodiment of a process for routing emergency data messages to public safety answering points may include identifying PSAPs local to the user and configured to receive emergency data messages. A determination of distribution of previous emergency data messages to the identified PSAPs may be performed. Based on the distribution of previous emergency data messages to the identified PSAPs, one of the identified PSAPs may be selected and the emergency data message may be routed thereto.

One process for distributing emergency data messages at a PSAP may include receiving an emergency data message at a PSAP. Distribution of emergency data messages to operator stations configured to handle a type of emergency data message of which the emergency data message is classified may be determined. One of the operator stations may be selected based on the determined distribution, and the emergency data message may be distributed to the selected operator station.

BRIEF DESCRIPTION OF THE DRAWINGS

Illustrative embodiments of the present invention are described in detail below with reference to the attached drawing figures, which are incorporated by reference herein and wherein:

FIG. **1** is an illustration of illustrative network environment in which users of wireless communications devices are able to send emergency data messages via an emergency data message router to local public safety answering points;

FIG. **2** is an illustration of a user of a wireless communications device operating in a cell site in which multiple PSAPs have different communications capabilities;

FIG. **3** is a block diagram of an illustrative communications network environment configured to receive and process emergency data messages to PSAPs local to users who sent the emergency data messages;

FIG. **4** is a flow diagram of an illustrative process for a mobile switching center to receive and process emergency data messages;

FIG. **5** is a flow diagram of an illustrative process for selecting a PSAP local to a user who sent an emergency data message;

FIG. **6** is a flow diagram of a more detailed illustrative process for determining a PSAP local to a user who sent an emergency data message based on PSAP distance from the user and communications capabilities of the local PSAPs;

FIG. **7** is a block diagram of an illustrative network environment in which emergency data messages may be distributed to PSAPs in a balanced manner; and

FIG. **8** is a flow diagram of an illustrative process for distributing emergency data messages to PSAPs in a balanced manner.

DETAILED DESCRIPTION OF THE DRAWINGS

With regard to FIG. **1**, a network environment **100** provides users **102***a*-**102***n* (collectively **102**) of wireless communications devices **104***a*-**104***n* (collectively **104**), which may be mobile telephones, personal digital assistants (PDAs), wireless electronic games, multi-mode telephones, or other electronic devices capable of communicating emergency data messages (EDMs) **106***a*-**106***n* (collectively **106**) to public safety answering points (PSAPs) **108***a*-**108***n* (collectively **108**). As understood in the art, multiple wireless network operators may be concurrently providing wireless services using various operating frequencies and network protocols. Emergency data messages may include text messages, instant messages (IMs), emails, photo messages, video messages, and the like. The emergency data messages **106** may be communicated to an emergency network address, such as Internet Protocol (IP) domain routing address "emergency.org," "**911**.**911**," or any other network address, by users **102** from the wireless communications devices **104**. In one embodiment, the emergency data messages **106** may be generated and communicated by activating a single emergency data message button, either a hard-button or a soft-button, that causes the wireless communications devices **104** to generate a pre-established data message.

A preestablished or pre-formatted data message, such as a text message, may include information associated with a respective user, such as a network identification number (NID), mobile electronic device identification number (MEID), which is commonly called a cell code identifier, user's name, telephone number, home or work address, secondary contact number, or any other information associated with a user such that an operator at a PSAP or emergency personnel (e.g., police) may have information of the user if he or she is unable to be immediately located. In addition, the emergency data messages **106** may be appended with a checksum, such that the message can be validated to be received without error. It should be understood that various checksum algorithms may be employed and may or may not include capabilities to detect and correct errors. Alternatively, a "free-form" data message, such as a text message, may be sent to an emergency network address, but the user may run the risk of being incomplete or too "cryptic" due to being in an emergency situation or using abbreviations unfamiliar to PSAP operators. The emergency data message may be communicated via the network(s) **110** to a PSAP local to the respective user. As not all wireless communications devices are configured to generate preformatted emergency data messages, a user may generate and communicate a freeform emergency data message (e.g., text message, email, instant message, image message) to a network address, such as Internet domain name "911.911," for routing to a PSAP local to the user. A freeform emergency data message is any data message that is addressed and communicated to a network address for routing to a PSAP local to the user.

The networks **110** may include mobile networks, wireless communications networks, Internet, public switched telephone network (PSTN), or any other network capable of communicating an emergency data message to the PSAPs **108**. As shown, an emergency data message **106***a* is communicated from the wireless communications device **104***a* via the network(s) **110** to an emergency data message router (EDMR) **112**, which may be located at an emergency message address that is configured to determine a PSAP **108***a* that services a geographic area in which the user **102***a* is currently located.

The emergency data message router **112** may be a centralized router associated with an address to which the emergency data messages **106** are communicated or may be configured as distributed routers that handle incoming emergency data messages from respective regions of the country or world. The emergency data message router **112** may receive data communicated with an emergency data message that may be used to identify a geographic location, geographic area, cell site, or otherwise, as further described herein. In addition, the emergency data message router **112** may determine which of the PSAPs local to a user sending an emergency data message has communications capabilities for handling the type of emergency data message (e.g., text message) being sent. In one embodiment, the EDMR **112** may recognize that a PSAP can only accept certain types of message formats based, and may perform a lossless message format translation from one format to another based upon this recognition.

With regard to FIG. **2**, a cell site **200** operates to handle wireless communications calls and messages communicated from users within the cell site **200**. As shown, a user **202** using a wireless communications device **204** communicates an emergency data message **206** to any cell tower **208***a*-**208***n* (collectively **208**) or other wireless access points within the range of the wireless communications device **204**.

Each of the PSAPs **210** may have different communications capabilities. For example, while all the PSAPs have voice capabilities, some PSAPs may be more limited. Not all PSAPs will have text messaging capabilities, image viewing capabilities (e.g., photographs and videos), e-mail capabilities, and so forth. Depending on the type of emergency data message sent by the user **202** using the wireless communications device **204**, which may have a wide variety of messaging capabilities, the emergency data messages **206** may be communicated to a PSAP that is local to the user (e.g., within the cell site **200**) and has communications capabilities that are compatible with the emergency data messages (e.g., includes the ability to receive text messages through a mobile or other communications system, as understood in the art).

With regard to FIG. **3**, a network environment **300** is configured to enable a user **302** using a wireless communications device **304** to communicate emergency data messages to public safety answering points **305***a*-**305***n* and/or **305***m*-**305***z* (collectively **305**). The PSAPs **305***a*-**305***n* are representative of PSAPs that are capable of receiving text messages and telephone calls, and the PSAPs **305***m*-**305***z* are PSAPs that are capable of receiving emergency data messages in the form of e-mail messages or other data format that is generally communicated over IP networks, as well as telephone calls. It should be understood that the PSAPs **305***a*-**305***n* and **305***m*-**305***z* may overlap by one or more PSAP having multiple types of communications capabilities. It should be understood that the communications capabilities of the PSAPs **305** may vary over time as technology advances.

The user **302** may send an emergency data message package **306** by making an emergency data message request on the wireless communications device **304**. In making the emergency data message request, the user may select a single button, multiple buttons, or use a menu system to cause the wireless communications device **304** to generate and communicate an emergency data message (EDM) **308***a*. In one embodiment, an emergency data message **308***a* may be a pre-established text message that includes NID, MEID, contact information of the user, such as telephone number, home

address, name, and other contact information, and insert geographic coordinates, such as GPS coordinates, that identify a location at which the user **302** is located at the time the user makes the emergency data message request. Alternatively, the emergency data message **308***a* may be a conventional data message (e.g., text message, instant message, or email) that a user initiates without a template or pre-established data being initially generated. The emergency data message package (EDMP) **306** may include the emergency data message **308***a* that may include up to 160 characters, in the case of an SMS message, abbreviated dialing code **308***b*, and mobile directory number (MDN) **308***c*.

The abbreviated dialing code **308***b* may be an alphanumeric code that is stored in the wireless communications device **304** and communicated with the emergency data message **308***a* to a mobile switching center (MSC) **310**. The abbreviated dialing code **308***b* may be established by a service provider and/or manufacturer of the wireless communications device **304**. The abbreviated dialing code **308***b* may essentially be any code, typically a ten digit code, that indicates that an emergency data message is being communicated from the wireless communications device **304**. As an analogy, on the voice network there are many different types of abbreviated dialing codes, including "**411**" for placing an information call to a service provider, "**911**" for placing an emergency telephone call, and so on. As an example, an abbreviated dialing code for indicating that an emergency data message is being communicated may be "0000000SOS." Alternatively, if different types of emergency data messages are available for selection using a menu system on the wireless communications device **304**, then different abbreviated dialing codes may also be selectively communicated to represent the selected emergency data message that is being sent. For example, the abbreviated dialing codes may include "000000SOS1," "000000SOS2," "000000SOS3," and so on to indicate different types of emergencies and certain content in the emergency data messages. The different types of emergencies may include medical condition, automobile accident, fire, assault, or any other type of emergency data message that may be helpful to an operator at a PSAP for dispatching emergency personnel.

For SMS messages, when the mobile switching center **310** receives the emergency data message **306**, the mobile switching center **310** routes the emergency data message **306** to an originator data message service controller (DMSC(O)) **316**. The DMSC(O) **316** utilizes a process executed by a processing unit **312***a* that determines whether the emergency data message **308***a* is, in fact, an emergency data message being communicated to a PSAP or a standard data message, such as a text message being communicated between peers. In addition, the MSC **310**, DMSC(O) **316**, or other network node may perform additional functions, such as initiate continuous geographic coordinate or geo-coordinate updates to the PSAP, if the emergency data message **306** is determined to be inclusive of certain content, such as hostage situation, by inspecting the abbreviated dialing code or other data.

The DMSC(O) **316** may also include a memory **312***b*, which may include random access memory, disk drive memory, or other memory as understood in the art, that stores data and software and input/output unit **312***c* that communicates data over a network and with other local devices. In one embodiment, the memory **312***b* may store abbreviated dialing codes so as to be used by the processing unit **312***a* in determining whether the emergency data message **308***a* is, in fact, a priority message. In doing so, the processing unit **312***a* processes or parses the emergency data message package **306** to determine whether an abbreviated dialing code **308***b* is included or otherwise communicated with the emergency data message **308***a*. If it is determined that the emergency data message is a priority message, then the processing unit **312***a* may communicate the abbreviated dialing code **308***b* to an emergency data message short code database (EDMSC DB) **314**, which may be local or remote from the DMSC(O) **316**.

The emergency data message short code database **314** may include a listing (see TABLE I) of abbreviated dialing codes and short codes associated therewith so as to return an emergency data message short code **308***d* to the DMSC(O) **316** that is indicative of the type of emergency data message **308***a*. The emergency data message short code **308***d* may be alphanumeric data and utilized by other nodes in the network environment **300** for prioritizing processing of the emergency data message package **306'**, which includes the emergency data message **308***a* (e.g., text), mobile directory number **308***c*, emergency data message short code **308***d*, and cell code **308***e*. The cell code or cell code identifier **308***e* is a data value associated with a cell of a mobile communications system and is typically determined by the mobile switching center **310** by determining to which cell tower the wireless communications device **304** is communicating.

The DMSC(O) **316** processes the emergency data message **306'** for routing to emergency data message router **318**. This processing may include message decoding of the abbreviated dialing code **308***b* and initiating additional action, such as notifying alternative wireless carriers to provide continuous geo-coordinate updates to the PSAP, if possible. In addition, the DMSC(O) **316** may perform message format translation from one format to another format. In another embodiment, for SMS messages, the function described above could be performed at the MSC **310** or SMSC (not shown), which would avoid modification to the MSC **310** or inclusion of the DMSC(O) **316**.

TABLE I

ADC	EDM Short Code	TYPE
SOS0	EMERGENCY0	Default
SOS1	EMERGENCY1	Medical
SOS2	EMERGENCY2	Automobile Accident
SOS3	EMERGENCY3	Fire
SOS4	EMERGENCY4	Assault

In the case of Instant Messaging, when the mobile device initiates an emergency IM, the IM is rerouted to the DMSC (O) **316** instead of the user's normal IM service provider's servers. The DMSC(O) **316** perform functions previously defined to determine the proper PSAP. For email, the addressee domain name is the emergency indicator. In one embodiment, the user's email provider routes the message to the appropriate DMSC(O) based on that addressee's Internet Protocol Domain Name Service (DNS) resolution. This DMSC(O) **316** may be a clearinghouse type of DMSC(O). In another embodiment, software on the device intercepts the email and reroutes it to the carrier's DMSC(O) for processing. If the DMSC(O) **316** determines it is not an emergency, it forwards to the appropriate email provider's system.

The emergency data message router **318** may execute a process on processing unit **319***a* that processes the emergency data message package **306'** to communicate the cell code **308***e* to a PSAP capabilities defining system (PCDS) **320**. In an alternative embodiment, the emergency data message router **318** and PCDS **320** are configured on a single computing system. The processing unit **319***a* may include one or more processors. Other computing and communications components, such as a memory **319***b* for storing data and

software, input/output (I/O) unit **319***c* for communicating data over a network, may be included in the emergency data message router **318**, as understood in the art. The PCDS **320** may execute a process on a processing unit **322***a* for determining PSAPs local to the user **302** and communications capabilities of PSAPs that are determined to be local to the user **302**. The PCDS **320** may also include a memory **322***b* for storing memory and software and input/output unit **322***c* for communicating data over a network and/or with the EDM router **318**. Determination may be made on information provided as part of the message including geo-coordinates of the sending device and geo-coordinates of the PSAPs using an algorithm to determine the nearest emergency service provider as per the emergency type.

In determining local PSAPs, the PCDS **320** may receive the mobile directory number **308***c* and cell code **308***e* and use a three-digit exchange code portion of the MDN **308***c* and/or cell code **308***e* to determine whether there is a PSAP local to the exchange code of the wireless communications device **304** by matching the three-digit exchange code of the MDN **308***c* and exchange code associated with the PSAPs. However, because the wireless communications device **304** is mobile and may be utilized outside the exchange area in which the wireless communications device **304** is initially registered, a PCDS **320** may or may not use the MDN **308***c* in determining a local PSAP to the user **302**. For example, if the exchange code digits of the MDN **308***c* are foreign to an area in which the wireless communications device **304** is operating, then the PCDS **320** may be limited to using the cell code **308***e* to determine PSAPs that are local to the user **302**. A combination of both the cell code **308***e* and exchange code may be used to determine local PSAPs. Alternatively, a determination may be made on information provided as part of the message including geo-coordinates of the sending device and geo-coordinates of the PSAPs using a mathematical vector algorithm or equivalent database query to determine the nearest emergency service provider as per the emergency type.

An emergency data message router database **324** may be in communication with the PCDS **320** to enable the PCDS **320** to look up PSAPs that are (i) local to the user **302** and (ii) have particular communications capabilities. The emergency data message router database **324** may be local to or remotely located from the PCDS **320**. The communications capabilities may include the ability to receive text messages, instant messages, e-mails, photo messages, or video messages, as understood in the art. In determining the communications capabilities, the PCDS **320** and/or EDMR DB **324** may determine an address associated with a local PSAP, and the communications capabilities may be identified by the type of address (e.g., telephone number or IP address) or position of the address within the EDMR DB **324**.

With each of these communications capabilities, the PSAPs have access to communications network(s) that are capable of communicating compatible emergency data messages of those types. It should be understood that the PCDS **320** and process being executed by the processing unit **322***a* may identify the type of emergency data message **308***a* that is being communicated and determine which PSAP local to the user **302** is capable of receiving that type of emergency data message. For example, if the emergency data message **308***a* is a text message, then a PSAP that is both local to the user and has capabilities of receiving emergency text messages may be determined to be most compatible with the emergency data message that is being communicated to request emergency assistance.

Although a PSAP that is closest to the user **302** may be considered ideal from an emergency personnel deployment perspective, because emergency data messages are being communicated by the user **302**, and many PSAPs are not equipped to handle certain types of communications, the PCDS **320** may determine whether any PSAPs local to the user **302** are compatible with the emergency data message **306'** that is being communicated before selecting the PSAP to route the emergency data message **308***a*. In other words, an emergency data message sent in its original form may be best to provide to a PSAP in that same form to avoid loss of data, corruption of the data, or misinterpretation by a PSAP operator. Any translations that may be performed to convert from one format to another are lossless; meaning no loss of any information.

To determine whether a PSAP has compatible communications, the emergency data message router **318** may determine, by examining a packet header or other data field(s), generate, and communicate an emergency data message type (EDMT) **309**, which may be an alphanumeric value and is indicative of the type of emergency data being communicated (e.g., text, image, instant message, email). The PCDS **320** may use and/or communicate the EDMT **309** to the emergency data message router database **324** to identify any PSAPs local to the user that have communications capabilities that are compatible with the emergency data message type. If, for example, it is determined by the PCDS **320** that there are no PSAPs local to the user **302** that are compatible with receiving text messages based on the EDMT **309**, then the PCDS **320** may determine that an emergency text message may be communicated to a local PSAP by sending the PSAP to a text-to-speech translator for converting the text-to-speech for audible communication to the local PSAP. The emergency data message router database **324**, in response to locating a local PSAP with the most compatible communications capabilities, may return a PSAP telephone number **308***f* or PSAP IP address **308***g*, depending on the communications network that is available to communicate the type of emergency data message received from the wireless communications device **304**. The PSAP telephone number **308***f* may be used for a text message or image message to be communicated to the PSAP and the PSAP IP address **308***g* may be used for communicating an email to the PSAP, for example. Other types of message translations may be employed as available.

Depending on whether the selected PSAP is to be communicated via an SS7 clearinghouse (CH) **326***a* and SS7 network **326***b*, IP network **327**, wireless communications network **330** (e.g., mobile network), or any other communications system or network, the emergency data message router **318** may communicate the emergency data message **308***a* to the telephone number or address of the selected PSAP. If the emergency data message **306"** is to be communicated over the SS7-CH **326***a* and network **326***b*, then the PSAP telephone number **308***f* is communicated with the emergency data message short code **308***d* and emergency data message **308***a* to the PSAP **305***n* that is determined to be local to the user **302** and capable of receiving the emergency data message **308***a* having the appropriate communications network connection and software interface for displaying the emergency data message **308***a*.

The emergency data message package **306"** is communicated via a terminating data message service controller (DMSC(T)) **328** for routing to the appropriate PSAP via the PSTN **329***a* or wireless communications network **330**. If the emergency data message **308***a* is a text message or image, then the DMSC(T) **328** may route the EDMP **306"** via the wireless communications network **330**, including a mobile switching center **332** and base station **334**, to one of the PSAPs **336***a*-**336***n* (collectively **336**). The PSAPs **336** may be

limited to wireless or mobile communications or have multiple communications capabilities. It should be understood that although the PSAPs **305***a*-**305***n*, **305***m*-**305***z*, and **336***a*-**336***n* are shown to be in communication with different communications networks, that each may be in communication with one or more of the communications network and have separate devices that communicate with respective communications networks or have a device that is capable of receiving and/or consolidating emergency messages from different communications networks.

If, alternatively, the emergency data message **308***a* is an email rather than a text or photo message, then the PCDS **320** determines a PSAP local to the user **302** that is configured to receive emails and routes the emergency data message package **306'''** via the IP network **327** to a PSAP **305***m* that is local to the user **302** and configured to receive and display emails. In determining the appropriate PSAP, the PCDS **320** accesses the emergency data message router database **324** to look-up a local PSAP with email communications capabilities and receives the PSAP IP address **308***g* from the emergency data message router database **324** for communicating the emergency data message package **306'''** to the PSAP IP address **308***g* at the PSAP, in this case PSAP **308***m*.

A communication link between the IP network **327** and PSTN **329***b* may be formed by including a session border controller **338**, gateway **340**, and class 4/5 telephony switch **342**, or parts thereof, as understood in the art, so that emergency data messages may be routed via the IP network **327** for distribution to a PSAP that is limited to communicating via the PSTN **329***b*, as may be found in rural areas of the country. Because different portions of the PSTN **329***b* may be configured to handle IP messaging from the IP network **327**, the PSTN **329***b* is shown separately from the PSTN **329***a*. Because the emergency data message **308***a* includes text, if the emergency data message **308***a* is communicated over the PSTN **329***a* or the IP network **327** and PSTN **329***b*, the text is converted by a text-to-speech system **344***a* or **344***b*, respectively, to generate an audible emergency message **346***a* or **346***b*, respectively. The decision and ability to route the emergency data message **308***a* via the SS7 network **326***b* or IP network **327** may be dependent upon the configuration of the EDM router **318**. However, because the emergency data message **308***a* is to be expedited to a PSAP, other factors, such as network congestion, selected PSAP communications capabilities, or other factors, may be used by the EDM router **318** to select which network path to communicate the emergency data message **308***a*. In addition, the EDM router **318** may raise the priority level on the IP packet if quality of service capabilities are available in the network.

More specifically, the emergency data message router database **324** may include a database or table that stores and manages, and/or also performs algorithm calculations to arrive at, PSAP cell codes, capabilities, and network addresses so that the PCDS **320** may select an appropriate PSAP to communicate the emergency data message based on a number of factors. The factors may include distance from the user, type of emergency data message, network connection, which may be indicated by whether a network address is available, geographic coordinates, and so forth. An illustrative listing of a table that may be managed and operated by the emergency data message router database **324** is shown in TABLE II below.

TABLE II

				Network Addresses		
PSAP	PSAP Cell Code	Exchange Codes	Capabilities	Voice (PSTN)	Text/Image (Mobile Network)	Email (IP Address)
Easton	3719	405	Voice	972-405-1234	—	—
Weston	3720	826, 259	Voice, Text	972-826-1234	972-259-9876	—
Central 1	3721, 3729	408	Voice	214-408-9876	—	—
Central 2	3721, 3730	528, 526	Voice, Text	214-528-1234	214-526-5555	—
Central 3	3721, 3729	528, 259	Voice, Text, Image, Email	214-528-5678	214-259-5555	127.37.17.38
South 1	3722, 3741	699	Voice	817-699-1234	—	—
South 2	3722, 3733	347, 283	Voice, Text	817-347-1234	817-283-5555	—
North	3723	277, 623	Voice, Text, Image, Email	972-277-1234	972-623-5555	128.94.1.23

The EDM router **318**, PCDS **320**, EDMR DB **324** or combination thereof may route or reformat, re-address, and/or route the emergency data message **308***a*. If a determination is made that a PSAP does not have a compatible communications capability as an emergency data message, then the emergency content of the emergency data message may be reformatted, re-addressed, and re-routed. If the emergency data message type matches the communications capabilities of a selected local PSAP, then the emergency data message **308***a* may be routed accordingly.

As an example, if the emergency data message type of the emergency data message **308***a* is a text message being communicated using SMS and the communications capabilities of a local PSAP includes text messaging, then the emergency data message package **306"** is routed to the SS7-CH **326***a* for delivery to a wireless device at one of the PSAPs **305***a*-**305***n*. If the communications capabilities of a local PSAP includes instant messaging without text messaging, then the emergency data message **308***a* is reformatted and re-addressed to comply with instant message protocols and sent to an instant message client at the PSAP via either the SS7-CH **326***a* and network **326***b* or IP network **327**, depending on a network address (e.g., telephone number or IP address) of the PSAP. If the communications capabilities of a local PSAP includes email, then the emergency data message **308***a* may be reformatted and re-addressed to comply with email protocols and sent to a PSAP email client with a priority indication, either the emergency data message short code **308***d* or otherwise. If the communications capabilities of a local PSAP is limited to voice only, then the emergency data message **308***a* is communicated to the text-to-speech system **344**, as understood in the art, via the DMSCM **328** for synthesizing speech of content of the emergency data message **308***a* and communication to the local PSAP. Alternatively, if the message format is not reformattable, nor is easily translated to speech, then the message may be routed to an alternative PSAP.

The PCDS **320** may further be configured to determine which of the PSAPs identified to be local to the wireless communications device and configured to handle emergency data messages of an emergency data message type of which the emergency data message **308***a* is classified to communicate the emergency data message **308***a* and the associated data. In determining which PSAP to communicate the emergency data message **308***a*, the processing unit **322***a* of the PCDS **320** may access historical information stored in the memory **322***b* that is indicative of emergency data messages previously sent to the identified PSAPs. The information may include statistical and/or aggregate information that indicates a total number of emergency data messages that have been sent to each of the PSAPs over a given time period, such as within the past hour, eight hours, day, or week. The historical information may further include a record of how may operator stations or telecommunicator positions are configured to receive different emergency data message data types located at each of the PSAPs.

In determining which PSAP to send the emergency data message **308***a*, the processing unit **322***a* of the PCDS **320** may use the historical information so as to balance the number of emergency data messages sent to each of the identified PSAPs. A variety of different selection techniques may be used in selecting which PSAP to send the emergency data message **308***a*. For example, the processing unit may balance the number of emergency data messages communicated to each of the identified PSAPs by volume or total number, by volume over a given time period (e.g., emergency data messages per hour), or by average per operator station at each of the identified PSAPs (e.g., emergency data messages per operator station). Alternatively, the PCDS **320** may select an identified PSAP based on historical capacity or throughput (e.g., total number of emergency data messages processed per hour). It should be understood that any number of different measurement standards may be utilized to determine which of the identified PSAPs to send the emergency data message **308***a*.

The PCDS **320** may use the historical information in conjunction with location to determine an optimal PSAP to route the emergency data message **308***a*. The determination may include determining distribution of previous emergency data messages sent to PSAPs identified the PCDS to be local to the user and configured to receive emergency data messages of the type being routed. For example, the PCDS **320** may determine an average amount of time that it takes for each of the identified PSAPs to process or otherwise dispose of emergency data messages and compare that statistic to distance of the identified PSAPs from the user. A computation may be made as to whether it will take more time for closer PSAP to the user to process the emergency data message **308***a* than a PSAP that is farther from the user, thereby providing for a normalization of expected process time and distance between the different identified PSAPs. For example, a PSAP may be located 10 miles from the user, but have an expected process time of 1 minute, whereas a PSAP located 2 miles from the user may have an expected process time of 15 minutes, thereby making the PSAP farther from the user a better choice than the closer PSAP.

TABLE III is an illustrative table showing historical information of PSAPs. The historical information may include EDMs sent in the past hour, average processing time per EDM, and number of operator stations at the PSAPs. The PCDS **320** may utilize the statistical information and aggregate information to make a determination to distribute the emergency data messages. For example, if a user in cell code **3721**, which is covered by both Central 1 and 2 PSAPs, the system may select the Central 2 PSAP to handle the call as (i) only 28 emergency data messages have been sent to that PSAP in the past hour, which is below average, (ii) the capacity (i.e., operator stations) is higher than the Central 1 PSAP, and (iii) the average processing time per emergency data message is lower than Central 1 PSAP. It should be understood that a variety of different statistical parameters may be stored at the PCDS to manage distribution of emergency data messages to PSAPs. It should also be understood that a variety of different algorithms may be utilized to select a PSAP to send an emergency data message. Although specific classifications of emergency data messages are not shown, the historical information shown in TABLE III may be expanded to show more resolution based on different types of emergency messages (e.g., text, email, instant message), as different emergency message types may take more time to process than others due to volume, interface, operator skill, etc.

TABLE III

PSAP	PSAP Cell Code	Exchange Codes	Avg EDMs Sent per Hour	EDMs Sent in Past Hour	Average Processing Time per EDM (mins)	Operator Stations
Easton	3719	405	27	37	1.7	1
Weston	3720	826, 259	38	43	2.4	3
Central 1	3721, 3729	408	57	66	3.6	6
Central 2	3721, 3730	528, 526	85	28	1.2	8

With regard to FIG. **4**, an illustrative process **400** of a system identifying an emergency data message is provided. The process **400** starts at step **402**. At step **404**, a data message is received. The data message may be a text message, instant message, email, or any other data message that may be communicated from a wireless communications device. At step **406**, a determination may be made as to whether an emergency abbreviated dialing code is communicated with the data message. If so, then at step **408**, a short code associated with the emergency abbreviated dialing code may be requested. In addition, a determination of a cell code in which the wireless communications device that communicated the emergency data message may be determined. The emergency data message, short code, and cell code may be communicated to a PSAP at step **412**. In communicating to the PSAP, the information, including the emergency data message, short code, and cell code, is communicated via a communications network to a network address for determining a PSAP local to a user who sent the emergency data message. If, at step **406**, an emergency abbreviated dialing code is not communicated with the data message, then at step **414**, the data message is communicated to a recipient, as understood in the art. The process ends at step **416**.

With regard to FIG. **5**, an illustrative process **500** may be performed by a PSAP capabilities defining system, which may be in communication with an emergency data message router. At step **502**, an emergency data message, NID, and cell code identifier of a wireless communications device of a user

may be received. In addition, a mobile directory number may also be received. At step **504**, a PSAP local to the user may be selected. In selecting the local PSAP, a determination of the communications capabilities at one or more PSAPs local to the user may be determined using the cell code identifier and/or mobile directory number so as to determine which PSAP is nearest the user that has communications capabilities that are most compatible with the format of the emergency data message. At step **506**, the emergency data message may be sent to the selected PSAP.

With regard to FIG. **6**, a more detailed process **600** for determining to which PSAP to communicate an emergency data message is provided. At step **602**, a query of a PSAP database may be made to determine how many local PSAPs are available with respect to a user who communicates an emergency data message. At step **604**, a determination as to communications capabilities of each of the local PSAPs may be made. The determination may include determining the types of data messages that may be received by each of the PSAPs and communications networks to which the PSAPs are in communication. At step **606**, a determination may be made as to whether there are more than one local PSAP. If not, then at step **608**, a network address, such as a telephone number, IP address, or otherwise, of the local PSAP may be obtained. At step **610**, the emergency data message may be sent to the PSAP using the appropriate communications channel. For example, in the event that the emergency data message is a text message, then if the network address of the local PSAP is a telephone number that is operating on a mobile communications system, then the emergency data message may be communicated over the mobile communications system to the PSAP.

If at step **606**, a determination is made that more than one local PSAP is available, then at step **612**, a determination as to which of the PSAPs the emergency data message type is most compatible and closest to the user who sent the emergency data message. At step **614**, a network address of the PSAP determined to be the most compatible to the emergency data message type and closest to the user may be obtained. Although it may be desirable to identify the closest PSAP to the user and send the emergency data message to that PSAP, if the PSAP does not have communications capabilities to receive the emergency data message, then it may be as or more beneficial to find a PSAP that is further from the user and has the communications capabilities that accommodates the type of emergency data message that was sent so that an operator at the PSAP can handle the emergency request more efficiently. For example, if a PSAP is close to a user, but does not have text messaging capabilities and another PSAP which may be a few miles farther than the user but does have text messaging capabilities, then the emergency data message may be better communicated to the PSAP farther away even though the text message may be communicated to a text-to-speech system that may convert the information in the emergency text message for audible play to an operator at the closer PSAP. If no local PSAPs have text messaging capabilities, an emergency text message may be communicated to a text-to-speech converter so that the synthesized speech can be routed to a PSAP closest to the user. The process **600** continues at step **610**, where the emergency data message is communicated to the selected PSAP.

With regard to FIG. **7**, an illustration of a network environment **700** similar to that of FIG. **3**, including the PCDS **320** and PSAPs **305***a*-**305***n* (collectively **305**), is shown. A network **702** is configured to receive the emergency data message package **306** from the wireless communications device **304** and route the EDMP **306** to the emergency data message router **318**, which may have a network address, such as internet domain name '911.911', so as to be easy for users to remember. The EDMR **318** may parse the EDMP **306** to select parameters, such as cell code and mobile directory number, to communicate to the PCDS **320**. Alternatively, the entire EDMP **306** may be communicated to the PCDS **320**. The PCDS **320** may identify one or more PSAPs local to the wireless communications device **304** and configured to receive emergency data messages of the same type as the emergency data message being communicated is classified (e.g., SMS text message), as previously described. In one embodiment, the PCDS is configured to distribute the emergency data messages based on capacity utilization of each of the identified PSAPs.

The EDMP **306'** is communicated to a selected PSAP **305***a*. The PSAP **305***a* includes a PSAP server **704** includes a processing unit **706** and software **708** that may be configured to receive and process the EDMP **306'**. The PSAP server **704** may also include memory **710** for storing data and I/O unit **712** for communicating data over the network **702** and with operator stations **714***a*-**714***n* (collectively **714**). In processing the EDMP **306'**, the software **708** may be configured to manage distribution of an emergency data message **716** to the operator stations **714**. Selection of an operator station may be based on a variety of factors, including determining the configuration of each of the operator stations **714** to determine which can handle the type of emergency data message received, number of emergency data messages distributed to each of the operator stations **714**, pending emergency data messages to be processed at each of the operator stations **714**, average rate at which each emergency data message is being processed at each of the operator stations **714**, and so on. Selection of the operator station may be made to balance the number of emergency data messages, to minimize waiting time for response to each of the emergency data messages, or to maximize utilization of each operator at the PSAP, for example.

The emergency data message **716** may be processed by the software **708** for distribution to operator stations **714** that are limited to receiving emergency data messages. Alternatively, the emergency data message **716** may be distributed to operator stations **714** that are configured to handle both emergency data messages and emergency telephone calls. The operator stations **714** may enable the operator to respond to the emergency data message **716** by communicating a text message, email message, or any other type of message that is the same or analogous to the classification of the emergency data message **716**. In processing the emergency data message **716**, the operator at the telecommunicator position may use a prescripted TDD/TTY or any other protocol message for responding to the sender of the emergency data message **716**. After the operator has processed or handled the emergency data message, an archive of the emergency data message **716**, map coordinates, geographic coordinates of the user, other information associated with processing the emergency data message **716**, and response thereto, may be generated and saved by the software **708** at the PSAP for later retrieval, if desired.

In addition to selecting operator stations and distributing emergency data messages thereto, the software **708** of the PSAP server **704** may be configured to receive an emergency data message processed indicator **618** from the operator stations in response to the emergency data messages being processed. The PSAP server **704** may communicate each processed indicator **618** to the EDMR **318** to provide the PCDS **320** with notice so as to track statistics of performance of each of the PSAPs **305**. The processed indicator **618** may include

information, such as MDN, so that the PCDS **320** can identify which emergency data messages have been processed to update the historical information stored thereat. It should be understood that rather than sending a processed indicator that the PSAP server **704** may maintain statistical information for the PCDS **320** to request or for "pushing" to the PCDS **320** to maintain an up-to-date status of each PSAP (e.g., 50%, 80%, 100%, 120% capacity utilization) or a status indicator (e.g., "available," "maximum capacity," "over capacity").

With regard to FIG. **8**, an illustrative process **800** may be utilized by a PCDS or other network device to distribute emergency data messages to PSAPs. At step **802**, PSAPs local to the user and configured to receive emergency data messages may be identified. The PSAPs may be identified by a cell code, mobile directory number, or other identifier(s) associated with a wireless communications device that communicated an emergency data message. At step **804**, distribution of previous emergency data messages to the identified PSAPs may be determined. The distribution of previous emergency data messages may be from historical information stored at the PCDS. At step **806**, based on the distribution of previous emergency data messages to the identified PSAPs, one of the identified PSAPs to route the emergency data message may be selected. In selecting the PSAP, information indicative of capacity utilization, volume of emergency data messages previously sent to the identified PSAPs, or other historical information factors may be used in routing the emergency data message to the selected PSAP. The emergency data message may be distributed to the selected PSAP at step **808**.

Although the principles of the present have primarily been described with regard to wireless communications devices, it should be understood that wired communications devices, including wired/wireless computers, may be adapted to include emergency messaging, as described herein. One or more buttons or other initiation devices may be provided on the wired communications devices to generate and communicate an emergency data message to a network location for routing to a PSAP local to the user. In adapting the wired communications devices, software may be included in the devices to generate and communicate an emergency data message (e.g., text message or email) using a communications protocol that is capable of being communicated over the communications network (e.g., public switched telephone network, cable network, Internet), as understood in the art. Information specific to the user, location of the user, or otherwise may be included in the emergency data message. For example, name, address, number of people in residence, photograph, medical conditions, or any other information may be pre-established for retrieval and inclusion in the emergency data message, thereby providing information to an operator at a PSAP to provide emergency personnel, such as police, firemen, or medical personnel.

The previous detailed description is of a small number of embodiments for implementing the invention and is not intended to be limiting in scope. One of skill in this art will immediately envisage the methods and variations used to implement this invention in other areas than those described in detail. The following claims set forth a number of the embodiments of the invention disclosed with greater particularity.

We claim:

1. A system for routing emergency data messages to public safety answering points (PSAPs), said system comprising:

a memory;

an input/output (I/O) unit;

a processing unit in communication with said memory and I/O unit, and configured to:

receive an emergency data message and cell code identifier indicative of a location of a wireless communications device of a user, wherein the received emergency data message is of a data message type including at least one of text message, instant message (IM), email, photo message, and video message;

identify PSAPs local to the user and configured to receive emergency data messages, wherein said emergency data messages are of a data message type including at least one of text message, instant message (IM), email, photo message, and video message;

determine whether the capabilities of the identified PSAPs local to the user are matched with the data message type of the received emergency data message;

based on the determination of whether the capabilities of the identified PSAPs local to the user are matched with the data message type of the received emergency data message, select one of the identified PSAPs to route the received emergency data message;

route the received emergency data message to the selected PSAP;

store historical information of emergency data messages communicated to PSAPs in said memory, the historical information including distribution of the emergency data messages;

access the historical information stored in said memory;

update the historical information stored in said memory after routing the emergency data message to the selected PSAP;

receive data from respective PSAPs to which the emergency data messages were sent indicating that the emergency data messages were processed; and

update the historical information in said memory to include information reflective of the processed emergency data from the respective PSAPs;

generate a processed emergency data message per time unit statistical value; and

route the emergency data message based on the processed emergency data message per time unit statistical value.

2. The system according to claim **1**, wherein said processing unit is configured to select the PSAP to balance distribution of the emergency data messages among the identified PSAPs.

3. The system according to claim **1**, wherein said processing unit is configured to select the PSAP based on number of operator stations configured to receive a type of emergency data message of which is the emergency data message at each of the identified PSAPs.

4. The system according to claim **3**, wherein the processing unit is configured to balance the number of emergency data messages based on an average defined by the emergency data messages on a per operator station at each PSAP basis.

5. A method for routing emergency data messages to public safety answering points (PSAPs), said method comprising:

identifying PSAPs local to the user and configured to receive emergency data messages, wherein said emergency data messages are of a data message type including at least one of text message, instant message (IM), email, photo message, and video message;

determining whether the capabilities of the identified PSAPs local to the user are matched with the data message type of a received emergency data message, wherein said received emergency data message is of a

data message type including at least one of text message, instant message (IM), email, photo message, and video message;

based on the determination of whether the capabilities of the identified PSAPs local to the user are matched with the data message type of the received emergency data message, selecting one of the identified PSAPs to route the received emergency data message;

routing the received emergency data message to the selected PSAP;

storing historical information of emergency data messages communicated to PSAPs in said memory, the historical information including distribution of the emergency data messages;

accessing the historical information stored in said memory;

updating the historical information stored in said memory after routing the emergency data message to the selected PSAP;

receiving data from respective PSAPs to which the emergency data messages were sent indicating that the emergency data messages were processed; and

updating the historical information in said memory to include information reflective of the processed emergency data from the respective PSAPs;

generating a processed emergency data message per time unit statistical value; and

routing the emergency data message based on the processed emergency data message per time unit statistical value.

6. The method according to claim **5**, wherein selecting includes selecting the PSAP to balance distribution of the emergency data messages among the identified PSAPs.

7. The method according to claim **5**, wherein selecting includes selecting the PSAP based on number of operator stations at each of the identified PSAPs configured to receive a type of emergency data message of which the emergency data message is categorized.

8. The method according to claim **7**, further comprising balancing the number of emergency data messages sent to the PSAPs based on an average defined by the emergency data messages on a per operator station at each PSAP basis.

9. A method for distributing emergency data messages at a PSAP, said method comprising:

receiving an emergency data message at a PSAP, wherein the received emergency data message is of a data message type including at least one of text message, instant message (IM), email, photo message, and video message;

determining distribution based on the data message type of emergency data messages to operator stations configured to handle the emergency data message type of which the received emergency data message is classified;

selecting one of the operator stations based on the determined distribution to distribute the received emergency data message; and

distributing the received emergency data message based on the data message type to the selected operator station.

10. The method according to claim **9**, wherein distributing the emergency data message includes:

determining how many emergency data messages have been distributed to each operator station; and

selecting the operator station to distribute the emergency data message to balance a number of emergency data messages sent to each operator station.

11. The method according to claim **9**, further comprising:

determining a rate at which emergency data messages are being processed at each operator station; and

selecting the operator station to route the emergency data message based on a rate at which emergency data messages are being processed at each operator station and a number of emergency data messages in respective queues at each operator station.

12. The method according to claim **9**, further comprising:

communicating statistical information to a network node in response to processing emergency data messages received from the network node, the statistical information including an indication of at least one emergency data message being processed.

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